CENTRE FOR
INVASIVE SPECIES SOLUTIONS

BEST PRACTICE MANAGEMENT FOR THE CONTROL OF pond apple (*Annona glabra*)

ADDENDUM TO THE WEEDS OF NATIONAL SIGNIFICANCE POND APPLE MANAGEMENT MANUAL

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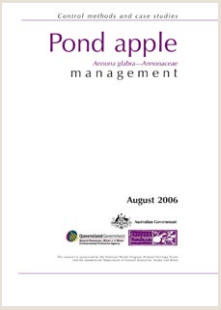
Front — Pond apple. Image by Ian Holloway, Queensland Parks and Wildlife Service.

Back — Pond apple seedlings. Image by Ian Holloway, Queensland Parks and Wildlife Service.

How to use this addendum



The pond apple management manual **(PDF, 832 kB) was published in 2006 and provides information on the weed and best practice management options. The manual has since been reviewed to ensure currency of best practice management advice and information. Any updates to the information contained within the manual are included in this addendum and should be taken as the most current source of information.**

Note: the addendum is not a standalone document and should be read in conjunction with the 2006 manual.

The addendum focuses on updates to control options, including mechanical, chemical and biological control methods. It also includes updates on available herbicides and where to go to find additional information on pond apple and its management.

When new or additional information is provided in the addendum, page numbers reference the related text in the original manual.

Section 2: Managing pond apple

Planning

Page 12 – A range of digital mapping apps and online mapping systems are now available and can be used to provide base property information such as topography, vegetation types, infrastructure and property boundaries.

Online assistance for mapping

Using an internet mapping tool is an effective way to record infestations of pond apple. There are many mapping tools freely available online. For example, the Atlas of Living Australia (www.ala.org.au) provides a free platform for interactive map making.

Another example is the free NT WeedMate App for iPhone and Android users (https://depws.nt.gov.au/rangelands/publications2/weed-management-publications/contribute-weed-data/weed-data-collection/nt-weedmate-app). This app helps you:

- collect information about weed species, density and location
- add extra information such as treatments, chemicals and growth stages
- organise your data in the standard format of the NT Weed Management Branch ready for mapping.

Section 3: The toolbox

Pond apple control considerations

Page 16 – Climatic conditions are typically hot and humid during pond apple control seasons, and infestations can be in remote areas and difficult to reach. Extreme heat and dehydration may pose risks for weed managers. You must consider human safety and welfare at both the planning and execution stages of pond apple control.

Choosing control methods

Page 18 – Various control methods used either over time or at the same time in different parts of the infestation provides the best chance of effective results.

Chemical control

Herbicide labels and legislation

Page 21 – The Australian Pesticides and Veterinary Medicines Authority (APVMA) regulates the availability of all pesticides, which includes herbicides. Herbicides are registered with the APVMA for specific applications, as stated on the label. State governments regulate the use of pesticides after sale. A herbicide label is a legal document that defines where, when and how a herbicide can be used on which weed species and at what rate.

Note: not all registered herbicides are commercially available. Often, companies improve herbicide formulations and only market the new formulation. For example, many herbicides are being marketed in higher concentrations. This reduces transport, storage and container-disposal costs

In addition to herbicides being registered and described 'on-label' for specific weeds and situations, herbicides can sometimes be used through permits or 'off-label' use. These situations are described below.

Minor use and emergency use permits

APVMA may issue minor use and emergency use permits for herbicide applications that are not otherwise registered for that particular use. Minor use permits are sometimes referred to as 'off-label' permits. Minor use and emergency permits are valid ('in force') for a limited time. See the APVMA website to find current permits.

Some states also have permits for the control of 'declared' weeds and may not specifically list the weed species to be controlled. These permits will often list a range of herbicides that can be used for the control of declared or environmental weeds. To find these permits for your state:

- go to the APVMA permits database search
- enter 'declared weeds' or 'environmental weeds' in the SEARCH box
- click the search term 'Pest/purpose'
- click 'Search'.

It is also recommended that if you are unsure which herbicides can legally be used on a particular weed in your state, contact the relevant biosecurity section of your state department of agriculture. When using herbicides in aquatic situations, only use those that are registered or permitted for use in and around aquatic areas.

Any minor use permits relevant to pond apple at time of publication are listed in Table 6.

Off-label use

Off-label use is the use of a registered chemical to address a specific issue that is not covered by the APVMA-approved label. Off-label use is to:

- control a different weed (or pest)
- apply at a different rate (only lower)
- apply in a different manner (not allowed in ACT, NSW and Tasmania).

Off-label use is permitted in all states and territories; however, conditions vary in each jurisdiction (Table 1).

Table 1. Where to find specific rules relating to herbicide use, including off-label use, in each state and territory

STATE/ TERRITORY	WEBSITE AND FURTHER INFORMATION
ACT	Agvet chemical use https://www.accesscanberra.act.gov.au/s/article/pest-and-weed-control-tab-Agvet-chemical-use
NSW	Pesticides https://www.epa.nsw.gov.au/your-environment/pesticides/pesticides-nsw-overview
	Weed control and identification https://www.dpi.nsw.gov.au/biosecurity/weeds/weed-control
NT	Chemical use https://nt.gov.au/industry/agriculture/farm-management/using-chemicals-responsibly
Qld	Chemical use https://www.business.qld.gov.au/industries/farms-fishing-forestry/fisheries/aquaculture/chemicals/registered
SA	Rural chemicals https://pir.sa.gov.au/biosecurity/rural_chemicals
	Weed control handbook https://www.pir.sa.gov.au/__data/assets/pdf_file/0020/232382/WEB_8867_PIRSA_Weed_Control_Handbook_2018.pdf (PDF, 4.2 MB)
Tas	Agricultural and veterinary chemicals https://nre.tas.gov.au/agriculture/agvet-chemicals
	Weeds https://nre.tas.gov.au/invasive-species/weeds
Vic	Off-label chemical use https://agriculture.vic.gov.au/farm-management/chemicals/offlabel-chemical-use
WA	Using pesticides safely https://ww2.health.wa.gov.au/Articles/U_Z/Using-pesticides-safely

Safety and training

Page 22 – Personal protective equipment (such as protective clothing, eye or face shields, and respiratory protection) must be used in accordance with the recommendations stated on the herbicide label or permit. Chemical-use training is required for people using herbicides as part of their job or business. Training is recommended for community groups and may be required if working on public land. Training courses are run by ChemCert, AusChem and TAFE in each state. Other training courses may be available through state agencies (e.g. AgTrain in Victoria, SMARTtrain in NSW), local councils or non-government organisations.

By law, you must read the label (or have it read to you) before using any herbicide product. Always follow the label or permit.

Chemical user certification

Page 22 – Commercial weed-control operators need to be licenced in most states (Table 2). It should also be noted that there is now shared responsibility between landholders and their contractors for any breaches of laws and regulations (such as herbicide drift).

Table 2. Chemical-user certification by state and territory

STATE/ TERRITORY	WEBSITE
ACT	www.accesscanberra.act.gov.au/s/article/pest-and-weed-control-tab-Agvet-chemical-use
NSW	www.epa.nsw.gov.au/your-environment/pesticides/licences-and-advice-for-occupational-pesticide-users
NT	nt.gov.au/industry/agriculture/farm-management/using-chemicals-responsibly/spray-applicator-licences
Qld	www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/chemical-controls/commercial-operators
SA	www.sa.gov.au/topics/business-and-trade/licensing/building-and-trades/pest-control-licence
Tas	nre.tas.gov.au/agriculture/agvet-chemicals/licences-and-certificates/ground-spraying-and-pest-management-licences
Vic	agriculture.vic.gov.au/farm-management/chemicals/licences-and-permits/commercial-operator-licence-for-contractors
WA	https://www.health.wa.gov.au/articles/n_r/pest-industry-licensing-and-registration

Effective use of herbicides

Successful herbicide control is dependent on the right herbicide for the target species, growth stage of the target species, weather conditions during and after spraying, how thoroughly the herbicide is applied, and the herbicide mix and application rate.

For spraying, wind speeds should be low (< 15 km/h) with no rain expected in the following six hours.

Do not apply herbicide to plants that are under any sort of stress, as herbicide will not be absorbed and translocated effectively, resulting in a reduced level of control. Plants may be stressed due to:

- dry soil
- low humidity
- air temperatures above 30 °C
- frost.

Effectiveness of herbicides can be maximised further by:

- mixing dye with the herbicide to help minimise missed areas and prevent overspraying (double spraying)
- using an adjuvant – an additive that improves herbicide uptake (always read the adjuvant's product labels to ensure that they are compatible with the particular herbicide and there are no restrictions on their use; e.g. most adjuvants should not be used near waterways)
- ensuring spray equipment is correctly calibrated and maintained, including being thoroughly cleaned between uses.

Spraying in sensitive areas

Herbicide users have a legal obligation to avoid spray drift damage and to ensure that the chemicals applied stay within the target area. Target weed infestations are often located in areas of native vegetation, so great care should be taken to avoid spraying surrounding foliage and soil. Do not use high pump/sprayer pressures that create small droplets which float in the air. Adjust the nozzle settings to produce coarser droplet sizes.

Using herbicides near water

Never spray herbicides over bodies of water or plants standing in water. Some herbicides are formulated to be a lower risk when used near water (e.g. Roundup® Biactive). NEVER add unregistered adjuvants to herbicides that will be used near water. Some states have publications explaining the safe use of herbicides near water (Table 3).

Table 3. Safe use of herbicides near water by state and territory

STATE/ TERRITORY	WEBSITE
South-eastern Australia	archive.dpi.nsw.gov.au/__data/assets/pdf_file/0011/319448/riparian-habitat-management-guide.pdf (PDF, 1.1 MB)
Qld	https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/sustainable/chemical/ground-distribution-herbicide/laws
SA	https://www.epa.sa.gov.au/files/477387_pesticide_water.pdf (PDF, 1.7 MB)
Tas	https://nre.tas.gov.au/Documents/herbicide_guidelinesFINAL2012.pdf (PDF, 689 kB)
WA	https://www.water.wa.gov.au/__data/assets/pdf_file/0016/3355/12149.pdf (PDF, 113 kB)

Regulations and permits for works in riparian zones

Areas on or near the bank of a river or other body of water (riparian zones) are sensitive habitats, and in some states a licence is required to conduct weed-control works (Table 4).

Table 4. Authorities who can advise about regulations and permits for works in riparian zones

STATE/ TERRITORY	DEPARTMENT	WEBSITE
NSW	NSW Department of Planning and Environment – Water	https://water.dpie.nsw.gov.au/
SA	Landscape SA, including 8 regional boards	https://www.landscape.sa.gov.au/
Vic	Catchment management authorities	https://viccatchments.com.au/about-us/our-cma-regions/
	Department of Energy, Environment and Climate Action – Forests and Reserves	Riparian management licences – www.forestsandreserves.vic.gov.au/__data/assets/pdf_file/0016/31426/Riparian-management-licences.pdf (PDF, 160 kB)

Herbicides for use on pond apple

Page 21 – Herbicides can be applied to pond apple in a number of ways:

- into the stem (stem injection)
- to the stump immediately after cutting (cut stump)
- on the leaves (foliar)
- to the stem and bark on the lower stem (basal bark).

Table 5 lists the herbicides that are registered for use on pond apple. Table 6 lists the minor use permits available, and the state/territory in which these registrations apply.

Stem injection

Page 25 – In addition to axe cut and drill and fill methods, stem injection of herbicide capsules can also be used to control pond apple infestations. Di-Bak AM is a herbicide produced in capsule form, containing a combination of aminopyralid and metsulfuron-methyl.

Capsules can be inserted into the tree using a specially designed handheld applicator. The applicator, used in conjunction with a handheld drill, first drills a hole into the tree stem and then inserts the capsule. The capsule is sealed in place with a plug.

Alternatively, drill a 25-mm-deep hole in the tree stem using an 8 mm-diameter drill bit, approximately 10–30 cm above ground level. Insert one capsule and seal with a plug immediately.

Over time, the capsule dissolves, releasing the herbicide into the plant. This process can be performed at any time of year and is a cost-effective method suitable for low-to-high-density populations.

Further information on using this technique can be found at https://www.bioherbicides.com.au/about/videos-resources

Table 5. Herbicides permitted for use on pond apple under registration as at September 2023

APPLICATION METHOD	CHEMICAL	TRADE NAME	STATE	RATE	COMMENTS
Basal bark	fluroxypyr (333 g/L)	Starane® Advanced	All	900 mL/100 L diesel or Biosafe®	Do not apply to trees growing in a body of water. Plants up to 20 cm basal diameter
Stem injection	aminopyralid + metsulfuron-methyl (93.7 g/kg + 75g/kg)	Di-Bak AM herbicide	All	1 capsule every 10 cm of circumference	Use the InJecta applicator to drill a hole and deliver Di-Bak AM capsule in the sapwood layer. Space capsule insertions at 10 cm, centres around tree circumference below any branching, otherwise remove or treat all branches below the capsule insertion. On multiple trunk trees ensure each trunk is treated. Apply capsules to each tree at waist height or below.

Table 6. Herbicides permitted for use on pond apple under minor use permits as at September 2023

APPLICATION METHOD	CHEMICAL	TRADE NAME[1]	RATE	COMMENTS
Permit PER13333 – Various herbicides/non-crop, agricultural, food-producing areas/environmental weeds – expires 31 March 2025				
Basal bark	picloram + triclopyr (240 + 120 g/L)	Access®	1:60 diesel or Biosafe®	Do not apply to trees growing in water. Treat stems up to 20 cm basal diameter. Ensure all stems on multi-stemmed plants are treated. Treat from ground level to a minimum height of 50 cm and apply to soak the bark of the stems. Do not treat wet bark.
Cut stump	glyphosate (360 g/L) registered for aquatic uses only	Roundup® Biactive	Undiluted to 1 L/5 L water	Paint stump immediately after cutting or paint basal bark.
Permit PER13684 – expires 28 February 2026. Control of pond apples in certain situations as described in 'Directions for use' table. Qld only				
Stem injection	glyphosate (360 g/L) – registered for aquatic uses only	Roundup® Biactive	500 mL/L water	Cuts should be made at waist height. To make an injection pocket at waist height, use a ¾ length axe with a blade width of 5–7 cm. The cut of injection must be through the bark and deep enough to place the chemical in contact with the sap wood. The chemical must be applied immediately after the dose pocket is made. Apply chemical with an applicator fitted with a tree injector kit that can be accurately calibrated. Set the vaccinator to deliver 1 mL of prepared solution per cut. Space cuts at 13 cm centres around tree. When treating trees less than the width of the axe, ensure chemical does not run out of the sides of the cut. This can be overcome by using the corners of the axe to make the pocket.
	triclopyr + picloram (200 + 100 g/L)[#]	Imtrade Commander Dual®	100 mL/L water	

APPLICATION METHOD	CHEMICAL	TRADE NAME[1]	RATE	COMMENTS
Basal bark	triclopyr + picloram (120 + 240 g/L)	Access® Herbicide	1.67 L/100 L diesel	DO NOT apply to trees growing in a water body. Basal bark plants with stems up to 20 cm basal diameter. Ensure all stems on multistemmed plants are treated. Spray the bark around the stems from the ground level to a minimum height of 50 cm wetting thoroughly to allow the spray mix to soak through the bark. DO NOT treat wet stems with basal bark mix as this can repel the diesel mixture.
	fluroxypyr (333 g/L) only	Starane® Advanced Herbicide	900 mL/100 L diesel	
Foliar	imazapyr (250 g/L) only	Unimaz® 250 SL Herbicide	800 mL/100 L water	DO NOT apply to plants in water. Lower the water level to expose the weed-infested band before application. A spray shield must always be used. See extensive critical use comments on permit. Refer to permit for critical use comments.

1 Commercial products listed here are examples only, and many other products containing these active ingredients are registered for use on pond apple. Search at https://apvma.gov.au/node/10831 to find registered products.

Since ***Permit PER13684*** was granted, most herbicides containing triclopyr + picloram as the active ingredients have increased the amount of triclopyr in the formulation from 200 g a.i./L to 300 g a.i./L. ***Under this permit you must only use products containing triclopyr 200 g a.i./L.***

Note: not all currently registered herbicides are commercially available. Check the company website for a current label.

Note: herbicides are not to be used for any purpose or in any manner contrary to the label unless authorised under appropriate legislation. By law, you must read the label (or have it read to you) before using any herbicide product. The same applies for minor use permits. Always follow the label and permit directions.

Mechanical control

Page 28 – Extensive trials using mechanical cut stump have not proved to be cost effective. Two tracked machines, one a bobcat and the other a mini excavator, cut trees off near ground level. Herbicides were applied to the cut stump by an additional operator for the bobcat, and directly by the machine for the mini excavator. However, problems getting around the pile of felled trees and stumps made the operation slow, and the cost was greater than using two operators and a chain saw. This method has not been widely adopted.

Biological control

Page 20 – There is currently no active research on biological control of pond apple being conducted in Australia. **No biocontrol agents have been released in Australia**.

Contacts

STATE/ TERRITORY	DEPARTMENT	PHONE	EMAIL	WEBSITE
National	Australian Pesticides and Veterinary Medicines Authority	02 6770 2300	enquiries@apvma.gov.au	www.apvma.gov.au
ACT	Parks and Conservation	13 22 81	ACTBiosecurity@act.gov.au	www.environment.act.gov.au/parks-conservation/plants-and-animals/Biosecurity/invasive-plants
NSW	Department of Primary Industries	1800 680 244	weeds@dpi.nsw.gov.au	www.dpi.nsw.gov.au/biosecurity/weeds
NT	Department of Environment, Parks and Water Security	08 8999 4567	weedinfo@nt.gov.au	www.nt.gov.au/environment/weeds
Qld	Department of Agriculture and Fisheries	13 25 23	info@daf.qld.gov.au	www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds
SA	Department of Primary Industries and Regions	1300 374 731	invasivespecies@sa.gov.au	www.pir.sa.gov.au/biosecurity/weeds
Tas	Department of Natural Resources and Environment	1300 368 550	biosecurity.tasmania@nre.tas.gov.au	www.nre.tas.gov.au/invasive-species/weeds
Vic	Agriculture Victoria	13 61 86	Refer to www.agriculture.vic.gov.au/about/contact-us for contact options	www.agriculture.vic.gov.au/biosecurity/weeds
WA	Department of Primary Industries and Regional Development	08 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au/pests-weeds-diseases/weeds

Further information

Research article on the efficacy of the EZ-Ject herbicide system. CSIRO Publishing (2011). https://www.publish.csiro.au/rj/RJ11038

Conference paper on investigating novel mechanical control options for pond apple. Asian-Pacific Weed Science Society (2011). Pages 492–496. https://researchoutput.csu.edu.au/ws/portalfiles/portal/9704340/29497_Weston_23rd%26%2320%3BAPWSS%26%2320%3BConference%26%2320%3BProceedings%26%2320%3BVol%26%2320%3B1.pdf (PDF, 8.6 MB)

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